

spectively, and the Cycadeæ and Coniferæ. In this connection one can not but deplore that in some quarters American botany has not yet freed itself from the altogether obsolete notion that the Coniferæ should be placed between the monocotyledons and the dicotyledons. — CONWAY MACMILLAN.

Effects of parasitism of *Ustilago antherarum* Fries.¹

Ustilago antherarum is included by Saccardo² under *U. violacea* (Pers.) Fckl. and is well known as parasitic in the anthers and ovaries of *Silene*, *Lychnis*, *Saponaria*, *Pinguicula*, *Stellaria* and other allied plants. By the growth of the fungus, what has been termed by A. Giard "parasitic castration of the anthers" takes place. There is, however, a hypertrophic development of the anther and in the diclinous flowers of *Lychnis*, which have in common with other such flowers rudiments of the undeveloped sporangia — this hypertrophy suffices to give the flower a monoclinal appearance. Under the irritation of the parasite the rudimentary anthers in pistillate *Lychnis* flowers are stimulated to develop, but the tapetal and archesporial layers of the thecæ are supplanted by the fungus mycelium and subsequent growth of spores. For a considerable time the *Ustilago* plant develops by a kind of symbiosis with the cells of the host. This goes so far that the anther walls are, in normally pistillate *Lychnis* flowers, stimulated to form the typical layers by which the ordinary dehiscence is brought about. Thus the *Ustilago* spores are scattered from the hypertrophic anthers of *Lychnis* precisely as if they were normal pollen spores. A corresponding and attendant atrophy of the pistil will be observed in most cases, and it is the nutritive stream which properly should go toward the pistil, that is diverted toward the hypertrophic anthers. And furthermore the various accessory characters of the staminate flower are developed in proper order under this parasitic stimulation, so that the normally pistillate but apparently staminate flower presents the appearance of pollen-bearing to such an extent that it is doubtless visited by those insects which habitually transfer pollen from the staminate flower to the stigma of the pistillate. Now as the *Ustilago* spores are developed in lieu of pollen spores and make their

¹Vuillemin: Sur les effets du parasitisme de l'*Ustilago antherarum*, Comptes Rendus Hebd. cxiii. 662. (1891.)

²Sylloge Fungorum vii. 574.

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appearance in a hypertrophic rudimentary anther which under their stimulation, forms the ordinary dehiscence lines, it happens that when the spores of the *Ustilago* are ripe, they are distributed by the same means and agencies which commonly distribute the *Lychnis* pollen. This is of clear advantage to the fungus for it is thus sown upon young buds as well as upon stigmatic areas. The whole series of phenomena is one which indicates in very interesting fashion how intimate and remarkable may be the relation between host and parasite.—CONWAY MACMILLAN.

The behavior of the pollen-tube of gymnosperms.

In a recent paper,¹ preliminary to a more complete research Belajeff publishes some suggestive observations regarding the divisions which take place in the pollen-tube of *Taxus baccata*.

It is well known that one or more cells are commonly cut off from the body of the pollen grain early in its development. Many have considered this cell or cells as representing a male prothallium, and Strasburger states that they have to do with the formation of the pollen tube, and after that have no further part to play. Belajeff, however, was led by his researches into the antheridia of the higher cryptogams and the pollen tubes of the angiosperms to think that it was not the large cell of the pollen grain of gymnosperms, but the small ones which have to do with fertilization. He therefore examined with great care the processes in *Taxus baccata* with the following result:

In this plant the contents of the pollen grain divides into two cells one large and one small. The larger one, *a*, produces the tube, the nucleus and other contents wandering to the apex. The smaller cell *b*, which remains behind, then divides into two by a partition transverse to the axis of the tube. The anterior of these two, *b'* then wanders toward the apex of the tube while the posterior *b''* becomes disorganized. Its nucleus however also wanders toward the apex, usually passing the anterior cell. The apex of the pollen tube now increases in size considerably as does also the cell *b'*. The nucleus of this now divides into two, one spherical, and the other lenticular. When fertilization occurs the wall of the pollen tube and the very delicate wall of the cell *b'* disappears and the

¹ Berichte der deutschen bot. Gesellschaft ix. 280. (1891.)